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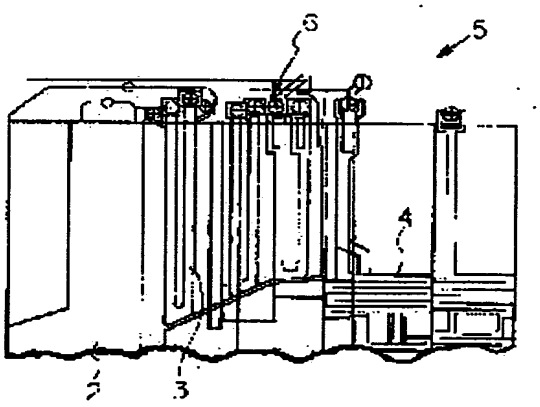
(54) METHOD FOR SUPPRESSING HIGH TEMPERATURE OXIDATION OF UNHEATED PART OF BOILER

(57)Abstract:
PROBLEM TO BE SOLVED: To reduce the decrease of thickness resulting from the high temperature oxidation of the members of an unheated part of a boiler.
SOLUTION: Paint obtained by mixing aluminium paste, silicon resin varnish, a solvent and an additive agent together so as to have the compounding weight ratio of the aluminium paste of 18 to 25%, that of the silicon resin varnish of 30 to 35 % and the ratio of aluminium to the resin of 0.7 or more is applied to the members of the unheated part of a boiler to form a high temperature oxidation-resistant coat. The permeation of oxygen to the members of the unheated part 6 of the boiler from atmosphere gas is delayed owing to aluminium included in the high temperature oxidation-resistant coat to reduce the oxidation of the members.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The high-temperature-oxidation control approach of a boiler non-heating unit that the combination weight ratio of an aluminum paste is characterized by applying to the member of a boiler non-heating unit the coating with which the aluminum paste, the silicon system resin varnish, the solvent, and the additive were mixed so that the combination weight ratio of 18 - 25% and a silicon system resin varnish might become 30 - 35% and the ratio of the aluminum to resin might become 0.7 or more, and forming the high-temperature-oxidation-proof covering film.
[Claim 2] The high-temperature-oxidation control approach of a boiler non-heating unit that the combination weight ratio of aluminum powder is characterized by applying to the member of a boiler non-heating unit the coating with which aluminum powder, the silicon system resin varnish, the solvent, and the additive were mixed so that the combination weight ratio of 25 - 35% and a silicon system resin varnish might become 20 - 30% and the ratio of the aluminum to resin might become 1.7 or more, and forming the high-temperature-oxidation-proof covering film.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the high-temperature-oxidation control approach of a boiler non-heating unit.
[0002]
[Description of the Prior Art] It has the posterior part heat transfer section 5 by which this boiler stands in a row by drawing 3 showing an example of a boiler to a thermal power station facility in the upper part of the furnace 2 which burns with air the fuel spouted from a burner 1, and this furnace 2, and the superheater 3 and the reheater 4 are arranged.
[0003] Conventionally, the ferrite system steel pipe is used for the boiler tube material which constitutes a superheater 3, a reheater 4, etc., without performing surface treatment so that it can respond to a thermal stress list at thermal fatigue.
[0004]
[Problem(s) to be Solved by the Invention] However, in a ferrite system steel pipe, since thinning of tubing resulting from high temperature oxidation is not avoided but tubing becomes below need thick by five to 100,000 operation time, tubing is exchanged and large sum expenses are needed.
[0005] Moreover, we are anxious about being in the inclination for member temperature to become high, and thinning of tubing being accelerated by improvement in a steam condition in recent years.
[0006] This invention is what was made in view of the actual condition mentioned above, and it aims at enabling it to reduce thinning resulting from the high temperature oxidation of the member of the non-heating unit of a boiler.
[0007]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, by the high-temperature-oxidation control approach of the boiler non-heating unit of this invention according to claim 1 So that the combination weight ratio of a silicon system resin varnish may become [the combination weight ratio of an aluminum paste] 30 - 35% 18 to 25% and the ratio of the aluminum to resin may become 0.7 or more The coating with which the aluminum paste, the silicon system resin varnish, the solvent, and the additive were mixed is applied to the member of a boiler non-heating unit, and the high-temperature-oxidation-proof covering film is formed.
[0008] Moreover, by the high-temperature-oxidation control approach of the boiler non-heating unit of this invention according to claim 2, the combination weight ratio of 25 - 35% and a silicon system resin varnish applies to the member of a boiler non-heating unit the coating with which aluminum powder, the silicon system resin varnish, the solvent, and the additive were mixed so that it might become 20 - 30% and the ratio of the aluminum to resin might become 1.7 or more, and the combination weight ratio of aluminum powder forms the high-temperature-oxidation-proof covering film.
[0009] Also in any of the high-temperature-oxidation control approach of claim 1 of this invention, or a boiler non-heating unit according to claim 2, by the aluminum contained in the high-temperature-oxidation-proof covering film, transparency of the oxygen on the front face out of a controlled

atmosphere of a boiler non-heating unit of a member is delayed, and oxidation of the member concerned is reduced.

[0010]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with the example of illustration.

[0011] Drawing 1 and drawing 2 are what shows an example of the gestalt of operation of the high-temperature-oxidation control approach of the boiler non-heating unit of this invention. By the approach concerned On the member front face of the non-heating units 6, such as the superheater 3 of a boiler, and an outlet pipe of a reheater 4 The primer 7 which makes aluminum powder a subject is applied, the lower layer of the high-temperature-oxidation-proof covering film is formed, the top coat 8 which makes an aluminum paste a subject is applied to the top face of this primer 7, and the upper layer of the high-temperature-oxidation-proof covering film is made to form in it.

[0012] As for the primer 7, the combination weight ratio of the aluminum powder of the range whose mean particle diameter is 5-25micro mixes with aluminum powder and a list a silicon system resin varnish and additives, such as an alcohols solvent which makes an aromatic hydrocarbons solvent a subject and a sedimentation inhibitor, and surface control material, so that the combination weight ratio of 25 - 35% and an epoxy denaturation silicon system resin varnish may become 20 - 30% and the ratio of the aluminum to resin may become 1.7 or more.

[0013] Moreover, top coat 8 contains a part for 65 - 75% of metal, and the aluminum paste of the range whose mean particle diameter is 5-20micro and whose water surface diffusion area is 8,000-40,000cm2/g is used. A methylphenyl silicon system resin varnish 18 to 25% so that the combination weight ratio of the silicon system resin varnish with which the combination weight ratio of this aluminum paste used the phenol modified resin varnish together to the subject may become 30 - 35% and the ratio of the aluminum to resin may become 0.7 or more An aluminum paste, A silicon system resin varnish and additives, such as an aromatic hydrocarbons solvent and a sedimentation inhibitor, surface control material, and a hardening accelerator, are mixed with a list.

[0014] When these coatings 7 and 8 were partially applied to the ferrite system steel pipe test piece and the test piece concerned was made to pass in a 600-degree C temperature ambient atmosphere for 2,000 hours, corrosion loss in quantity (decrease of weight) of the part which applied coatings 7 and 8 was about 1 of a non-painted part / seven to 1/20.

[0015] Moreover, when coatings 7 and 8 were partially applied to the member front face of the non-heating unit 6 of a boiler and the non-heating unit 6 concerned was made to pass in a 590-degree C temperature ambient atmosphere for about 12,000 hours, the oxidation layer thickness of the part which applied coatings 7 and 8 was about 1 of a non-painted part / three to 1/4.

[0016] Furthermore, Table 1 is what shows evaluation of the corrosion loss in quantity when carrying out predetermined time progress of the test piece which applied partially the various coatings into which the ratio of the aluminum to resin was changed in a 600-degree C temperature ambient atmosphere. Corrosion loss in quantity of a test piece cannot expect depressor effect of the corrosion loss in quantity to which the inclination which disagrees with the increment in the content of the aluminum to resin is presented, and the ratio of the aluminum to resin originates in high temperature oxidation in less than 0.7 coatings.

[0017]

[Table 1]

塗 料 名	A	B	C	D
アルミ金属／樹脂 比率	0.58 / 1	0.7 / 1	0.8 / 1	0.9 / 1
腐食減量の評価	×	○	○	◎

[0018] Thus, by the high-temperature-oxidation control approach of the boiler non-heating unit of this invention, by the aluminum contained in the high-temperature-oxidation-proof covering film, since transparency of the oxygen on the front face out of a controlled atmosphere of the non-heating units 6, such as the superheater 3 of a boiler and an outlet pipe of a reheater 4, of a member is made delayed, thinning resulting from the high temperature oxidation of the member of the non-heating unit 6 can be reduced.

[0019] In addition, as for the high-temperature-oxidation control approach of the boiler non-heating unit of this invention, it is needless to say that modification can be variously added within limits which are not limited only to the gestalt of operation mentioned above and do not deviate from the summary of this invention.

[0020]

[Effect of the Invention] Since transparency of the oxygen on the front face out of a controlled atmosphere of a boiler non-heating unit of a member is made delayed by the aluminum contained in the high-temperature-oxidation-proof covering film as stated above according to the high-temperature-oxidation control approach of the boiler non-heating unit of this invention, the outstanding effectiveness that thinning resulting from the high temperature oxidation of the member of a boiler non-heating unit can be reduced can be done so.

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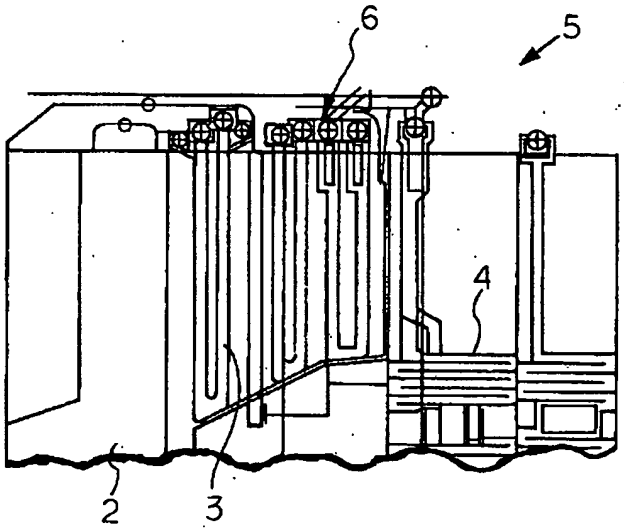
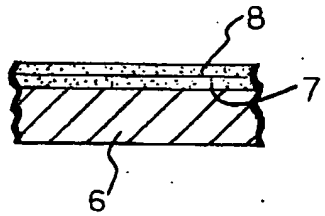
DRAWINGS

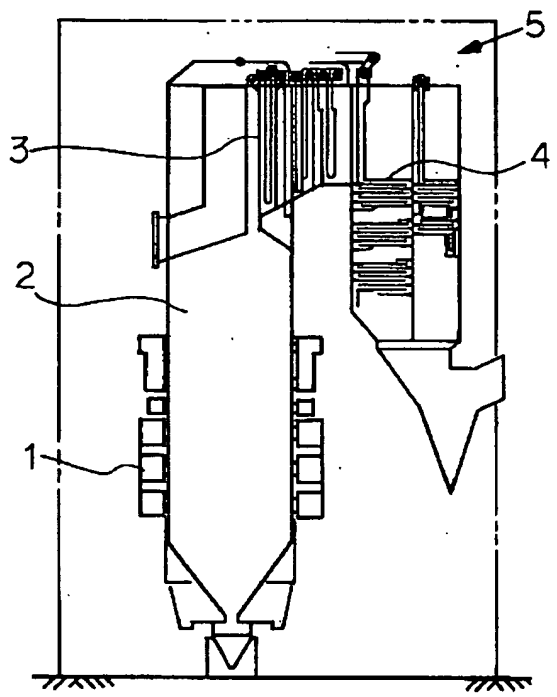
[Drawing 1]



[Drawing 2]



[Drawing 3]



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CLAIMS

[Claim(s)]
[Claim 1] The corrosion prevention approach of the atmosphere corrosion resisting steel characterized by painting the coloring coating with which at least one sort of binder resin chosen from a fluororesin, acrylic resin, polyester resin, acrylic silicone resin, and moisture hardening mold urethane resin and a pollution-free rust preventive pigment are contained, and the gloss retention 300 hours after an accelerated weathering test sunshine weather meter exposure forms 80% or more of paint film on an atmosphere-corrosion-resisting-steel front face.
[Claim 2] The corrosion prevention approach according to claim 1 that said coating contains a silane coupling agent.
[Claim 3] The corrosion prevention approach according to claim 1 or 2 that said coating carries out 5-40 mass section content of the epoxy resin which has a bisphenol frame to the binder resin 100 mass section.
[Claim 4] The coating characterized by being a coloring coating for the corrosion prevention of atmosphere corrosion resisting steel, and containing at least one sort of binder resin chosen from a fluororesin, acrylic resin, polyester resin, acrylic silicone resin, and moisture hardening mold urethane resin, and a pollution-free rust preventive pigment, and the gloss retention 300 hours after an accelerated weathering test sunshine weather meter exposure forming 80% or more of paint film.

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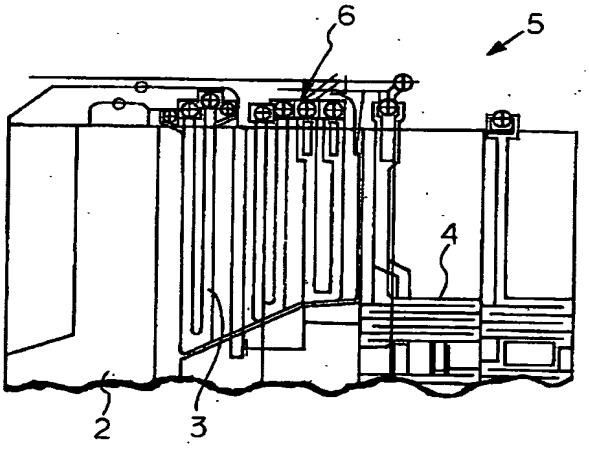
最終頁に続く

(54)【発明の名称】　ボイラ非加熱部の高温酸化抑制方法

(57)【要約】
【課題】　ボイラ非加熱部の部材の高温酸化に起因した減肉を低減する。
【解決手段】　アルミペーストの配合重量比が１８～２５％、シリコン系樹脂ワニスの配合重量比が３０～３５％となり且つ樹脂に対するアルミの比率が０．７以上になるように、アルミペースト、シリコン系樹脂ワニス、溶剤、及び添加剤を混ぜ合わせた塗料をボイラ非加熱部の部材に塗布して、耐高温酸化被覆膜を形成し、高温酸化被覆膜に含まれているアルミによって、雰囲気ガス中からボイラの非加熱部６の部材への酸素の透過を遅延させ、当該部材の酸化を低減する。



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【特許請求の範囲】

【請求項１】　アルミペーストの配合重量比が１８～２５％、シリコン系樹脂ワニスの配合重量比が３０～３５％となり且つ樹脂に対するアルミの比率が０．７以上になるように、アルミペースト、シリコン系樹脂ワニス、溶剤、及び添加剤を混ぜ合わせた塗料をボイラ非加熱部の部材に塗布して、耐高温酸化被覆膜を形成することを特徴とするボイラ非加熱部の高温酸化抑制方法。

【請求項２】　アルミ粉の配合重量比が２５～３５％、シリコン系樹脂ワニスの配合重量比が２０～３０％となり且つ樹脂に対するアルミの比率が１．７以上になるように、アルミ粉、シリコン系樹脂ワニス、溶剤、及び添加剤を混ぜ合わせた塗料をボイラ非加熱部の部材に塗布して、耐高温酸化被覆膜を形成することを特徴とするボイラ非加熱部の高温酸化抑制方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明はボイラ非加熱部の高温酸化抑制方法に関するものである。

【０００２】

【従来の技術】図３は火力発電設備にボイラの一例を示すものであり、このボイラは、バーナ１から噴出する燃料を空気とともに燃焼させる火炉２と、該火炉２の上部に連なり且つ過熱器３や再熱器４が配置されている後部伝熱部５とを備えている。

【０００３】従来、過熱器３や再熱器４などを構成するボイラチューブ材には、熱応力並びに熱疲労に対応できるように、フェライト系鋼管を表面処理を施すことなく用いている。

【０００４】

【発明が解決しようとする課題】しかしながら、フェライト系鋼管では、高温酸化に起因する管の減肉は避けられず、５～１０万運転時間で管が必要肉厚以下になるため、管の交換を実施しており、多額な出費が必要になる。

【０００５】また、近年、蒸気条件の向上によって、部材温度が高くなる傾向にあり、管の減肉が加速されることが懸念されている。

【０００６】本発明は上述した実情に鑑みてなしたもので、ボイラの非加熱部の部材の高温酸化に起因した減肉を低減できるようにすることを目的としている。

【０００７】

【課題を解決するための手段】上記目的を達成するため、本発明の請求項１に記載のボイラ非加熱部の高温酸化抑制方法では、アルミペーストの配合重量比が１８～２５％、シリコン系樹脂ワニスの配合重量比が３０～３５％となり且つ樹脂に対するアルミの比率が０．７以上になるように、アルミペースト、シリコン系樹脂ワニス、溶剤、及び添加剤を混ぜ合わせた塗料をボイラ非加熱部の部材に塗布して、耐高温酸化被覆膜を形成する。

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【０００８】また、本発明の請求項２に記載のボイラ非加熱部の高温酸化抑制方法では、アルミ粉の配合重量比が２５～３５％、シリコン系樹脂ワニスの配合重量比が２０～３０％となり且つ樹脂に対するアルミの比率が１．７以上になるように、アルミ粉、シリコン系樹脂ワニス、溶剤、及び添加剤を混ぜ合わせた塗料をボイラ非加熱部の部材に塗布して、耐高温酸化被覆膜を形成する。

【０００９】本発明の請求項１あるいは請求項２に記載のボイラ非加熱部の高温酸化抑制方法のいずれにおいても、耐高温酸化被覆膜に含まれているアルミによって、雰囲気ガス中からボイラ非加熱部の部材表面への酸素の透過を遅延させ、当該部材の酸化を低減する。

【００１０】

【発明の実施の形態】以下、本発明の実施の形態を、図示例とともに説明する。

【００１１】図１及び図２は、本発明のボイラ非加熱部の高温酸化抑制方法の実施の形態の一例を示すものであり、当該方法では、ボイラの過熱器３や再熱器４の出口管などの非加熱部６の部材表面に、アルミ粉を主体とする下塗り塗料７を塗布して耐高温酸化被覆膜の下層を形成し、該下塗り塗料７の上面に、アルミペーストを主体とする上塗り塗料８を塗布して耐高温酸化被覆膜の上層を形成させている。

【００１２】下塗り塗料７は、平均粒径が５～２５μの範囲のアルミ粉の配合重量比が２５～３５％、エポキシ変性シリコン系樹脂ワニスの配合重量比が２０～３０％となり且つ樹脂に対するアルミの比率が１．７以上になるように、アルミ粉、並びにシリコン系樹脂ワニスと、芳香族炭化水素系溶剤を主体とするアルコール系溶剤、及び沈降防止剤、表面調整材などの添加剤とを混ぜ合わせたものである。

【００１３】また、上塗り塗料８は、６５～７５％の金属分を含有し、平均粒径が５～２０μで且つ水面拡散面積が８，０００～４０，０００cm^2／ｇの範囲のアルミペーストを使用し、該アルミペーストの配合重量比が１８～２５％、メチルフェニルシリコン系樹脂ワニスを主体にフェノール変性樹脂ワニスを併用したシリコン系樹脂ワニスの配合重量比が３０～３５％となり且つ樹脂に対するアルミの比率が０．７以上になるように、アルミペースト、並びにシリコン系樹脂ワニスと、芳香族炭化水素系溶剤、及び沈降防止剤、表面調整材、硬化促進剤等の添加剤とを混ぜ合わせたものである。

【００１４】これらの塗料７，８をフェライト系鋼管試験片に部分的に塗布し、当該試験片を６００℃の温度雰囲気中で２，０００時間経過させてみたところ、塗料７，８を塗布した部分の腐蝕減量（重量減）は、無塗装部分の１／７～１／２０程度であった。

【００１５】また、塗料７，８をボイラの非加熱部６の部材表面に部分的に塗布し、当該非加熱部６を５９０℃

の温度雰囲気で約１２，０００時間経過させてみたところ、塗料７，８を塗布した部分の酸化層の厚さは、無塗装部分の１／３～１／４程度であった。

【００１６】更に、表１は、樹脂に対するアルミの比率を変えた種々の塗料を部分的に塗布した試験片を、６００℃の温度雰囲気中で所定時間経過させたときの腐蝕減量の評価を示すもので、試験片の腐蝕減量は、樹脂に対＊するアルミの含有量の増加に相反する傾向を呈し、また、樹脂に対するアルミの比率が０．７未満の塗料では、高温酸化に起因する腐蝕減量の抑制効果を期待できない。

【００１７】

【表１】

塗　料　名	A	B	C	D
アルミ金属／樹脂　比率	0.58 / 1	0.7 / 1	0.8 / 1	0.9 / 1
腐食減量の評価	×	○	○	◎

【００１８】このように、本発明のボイラ非加熱部の高温酸化抑制方法では、耐高温酸化被覆膜に含まれているアルミによって、雰囲気ガス中からボイラの過熱器３や再熱器４の出口管などの非加熱部６の部材表面への酸素の透過を遅滞させるので、非加熱部６の部材の高温酸化に起因した減肉を低減することができる。

【００１９】なお、本発明のボイラ非加熱部の高温酸化抑制方法は上述した実施の形態のみに限定されるものではなく、本発明の要旨を逸脱しない範囲内において種々変更を加え得ることは勿論である。

【００２０】

【発明の効果】以上述べたように、本発明のボイラ非加熱部の高温酸化抑制方法によれば、耐高温酸化被覆膜に※含まれているアルミによって、雰囲気ガス中からボイラ非加熱部の部材表面への酸素の透過を遅滞させるので、ボイラ非加熱部の部材の高温酸化に起因した減肉を低減することができる、という優れた効果を奏し得る。

【図面の簡単な説明】

【図１】本発明のボイラ非加熱部の高温酸化抑制方法の実施の形態の一例を示す概念図である。

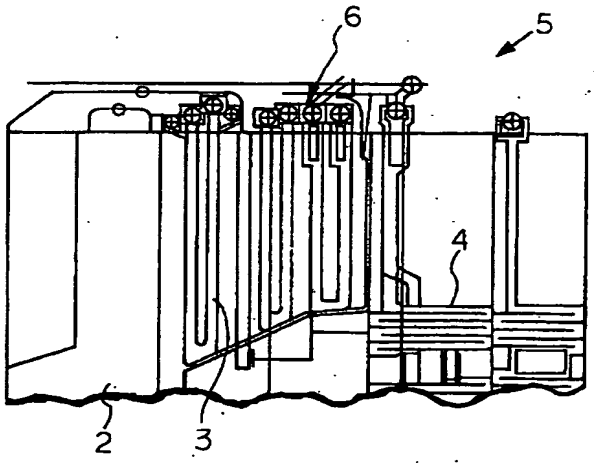
【図２】図１に関連するボイラの非加熱部の一部断面を表す概念図である。

【図３】従来のボイラの一例の概念を表す全体構成図である。

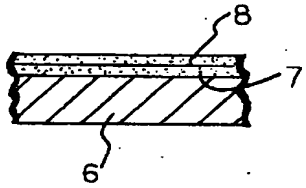
【符号の説明】

６　　非加熱部

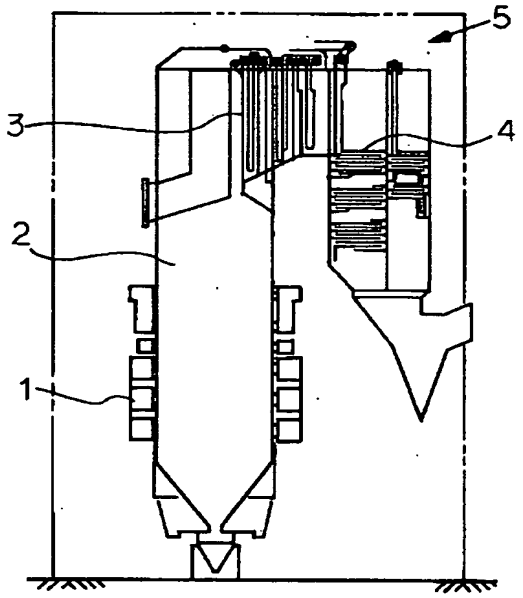
【図１】



【図２】



【図３】



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